

QUALITY ASSURANCE AUDIT REPORT

**Midlothian, Texas
Ambient Air Collection and Chemical Analysis
Midlothian, TX**

**Conducted:
June 30, 2009**

Prepared by:

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EXECUTIVE SUMMARY

On June 30, 2009, Darrin Barton of URS Corporation conducted performance and technical system audits of the Midlothian, Texas ambient air collection and chemical analysis monitoring program in Midlothian, Texas. The audits provided an independent assessment of the monitoring program.

There are five (5) monitoring locations involved in this program, identified as Sites Wyatt Road, CAMS 52, Midlothian High School, Jaycee Park, and Water Treatment Plant. Each location contains specific monitoring equipment and measurement systems as part of a network designed to document air quality. All monitoring equipment and measurement systems associated with the network were found to be in operation at the time of the audit and were subsequently audited. Performance audit results indicate acceptable responses for measurement systems and monitoring equipment with the following exception:

- The rain gauge at the Water Treatment site was found to be biased high forty percent. With an audit input of 0.10 inches the site sensor yielded a response of 0.14 inches.

Performance audit results are presented in this report. Any identified concerns or observations, were reported to the URS project team via a corrective action report (CAR) at the conclusion of the audit. For each issued CAR, the project team will initiate measures to resolve the identified area in a timely manner and a follow up concerning any CAR's will be conducted during the next audit.

1.0 Introduction

On June 30, 2009, Darrin Barton of URS Corporation conducted performance and audits of the Midlothian, Texas ambient air collection and chemical analysis monitoring program in Midlothian, Texas. This report, along with the attached appendices, documents the audit procedures, performance audit results, and identified concerns and observations. Where applicable, recommendations are offered to improve overall operations and quality control. At the conclusion of the audit, the auditor met with the project staff to discuss all results, identified concerns and observations.

1.1 Purpose

This audit was conducted as part of an independent URS quality assurance program for the Midlothian Ambient Air Collection and Chemical Analysis monitoring project. The objectives of the audit were to provide an assessment of the performance for air quality and meteorological monitoring equipment and to evaluate the technical systems employed.

1.2 Scope

The monitoring program for the Midlothian Ambient Air Collection and Chemical Analysis monitoring project consists of a network of five (5) monitoring locations with the following monitoring measurement systems:

- Sites 1, 2, 3c, 4, and 5.
 - Meteorological monitoring systems measuring wind direction, wind speed, temperature, barometric pressure and precipitation;
- Sites 1, 2, 3c, 4, and 5.
 - High-volume time-integrated PM₁₀ air monitors to collect particulate samples for the determination of metals other than Cr⁶⁺. Low-volume time-integrated air monitors to collect particulate samples for Cr⁶⁺.

1.3 Audit Procedures

Performance audits were conducted by comparing field measurements to an audit standard of known quality or through artificial field tests in which the instrument response is predicted. In each case, results were obtained and compared to the audit criteria for accuracy. Audit criteria used to assess each measured parameter are derived from the following:

- Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II: Ambient Air Specific Methods, Section 2.11, EPA/600/R-94/038b, revised April 1994;
- Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements, EPA/600/R-94/038d, revised April 1994; and
- Quality Assurance Project Plan (QAPP) for Midlothian, Texas Ambient Air Collection and Chemical Analysis.

Performance audit results for each measurement are summarized in this report, with detailed documentation provided in the appendix. Specific procedures and methods employed for the audit are described in the subsections below.

1.3.1 High-Volume PM₁₀ Sampler

Each PM₁₀ sampler was audited using a certified Volumetric Flow Control (VFC) orifice comparing the calculated audit flow rate to the sampler calibration flow rate and the designed (ideal) flow rate.

1.3.2 Cr⁶⁺ Sampler

The TEOM unit was audited for flow rate accuracy for the main flow. Flow rate accuracy was tested using a NIST-traceable volumetric flow meter for each portion of the flow system.

1.3.3 Wind Direction

Wind direction was audited for two independent characteristics: alignment of the sensor with respect to true north and output linearity. Alignment was tested using a certified compass transit by comparing the response of the sensor to the known magnetic declination. Output linearity was tested in 30-degree increments using a linearity device in both the clockwise and counterclockwise directions. These results were used to determine the maximum total error over the range of the sensor. Additionally, the condition of each sensor's bearings was inspected.

1.3.4 Horizontal Wind Speed

Wind speed was audited using a constant velocity motor drive unit for which several specific rates of revolution correspond to known wind speeds. In addition, the condition of each sensor's bearings was checked to ensure that the starting threshold (i.e., lowest detectable wind speed) was within manufacturer's specification.

1.3.5 Temperature

Temperature was audited by comparing the measured response against a collocated NIST-traceable digital thermometer over several time intervals.

1.3.6 Barometric Pressure

Barometric pressure was audited by comparing the measured response against a collocated NIST-traceable barometer over several time intervals.

1.3.7 Precipitation

Precipitation was audited by introducing a known amount of water into the gauge bucket and testing against the predicted response.

2.0 Audit Results

The following tables contain a summary of the performance audit results by measurement parameter. Detailed performance audit data are contained in the field audit data sheets section (Appendix A).

Table 2-1. PM₁₀ Audit Results

Site Number	Sampler Serial Number	Calculated Audit Flow (m ³ /min)	Sampler Flow (m ³ /min)	Audit Flow Rate Difference (%) (Criteria ± 7%)	Design Flow Rate Difference (%) (Criteria ± 10%)	Pass / Fail
1	580	1.126	1.152	2.4	-0.4	Pass
	675	1.126	1.131	0.5	-0.4	Pass
2	641	1.108	1.137	2.6	-1.9	Pass
	582	1.108	1.116	0.7	-1.9	Pass
	726	1.108	1.151	3.8	-1.9	Pass
3c	6673	1.107	1.113	0.6	-2.1	Pass
	6671	1.107	1.128	1.9	-2.1	Pass
4	6670	1.108	1.129	1.9	-1.9	Pass
	6672	1.108	1.136	2.5	-1.9	Pass
5	583	1.113	1.138	2.3	-1.5	Pass
	584	1.113	1.147	3.1	-1.5	Pass

Table 2-2. Cr⁶⁺ Flow Rate Audit Results

Site Number	Channel	Expected Flow Rate (LPM)	Measured Flow Rate (LPM)	Measurement Error (%) (Criteria $\pm 10\%$)	Pass / Fail
1	1	15.0	15.6	4.4	Pass
	2	15.0	15.8	5.7	Pass
2	1	15.0	15.6	3.9	Pass
	2	15.0	15.9	6.0	Pass
	1d	15.0	15.8	5.9	Pass
3c	1	15.0	14.8	-1.2	Pass
	2	15.0	15.7	5.2	Pass
4	1	15.0	15.8	5.3	Pass
	2	15.0	15.9	6.0	Pass
5	1	15.0	15.7	5.1	Pass
	2	15.0	15.8	5.8	Pass

Table 2-3. Wind Direction Audit Results

Site Number	Sensor Height (meters)	Alignment Error (°) (Criteria $\pm 2^\circ$)	Max Linearity Error (°) (Criteria $\pm 3^\circ$)	Max Total Error (°) (Criteria $\pm 5^\circ$)	Pass / Fail
1	10	-1.4	-1.08	-2.23	Pass
2	10	-1.4	-2.06	-3.36	Pass
3c	10	-1.4	-2.1	-3.42	Pass
4	10	-1.9	2.17	-3.93	Pass
5	10	0.1	2.34	1.49	Pass

Table 2-4. Horizontal Wind Speed Audit Results

Site Number	Sensor Height (Meters)	Audit Input Value (mph)	Sensor Measurement (mph)	Measurement Error (mph) (Criteria ± 0.4 mph)	Pass / Fail
1	10	0.6	0.6	0.0	Pass
		4.2	4.2	0.0	Pass
		10.1	10.1	0.0	Pass
		18.5	18.5	0.0	Pass
		36.4	36.4	0.0	Pass
		54.3	54.3	0.0	Pass
2	10	0.6	0.6	0.0	Pass
		4.2	4.2	0.0	Pass
		10.1	10.1	0.0	Pass
		18.5	18.5	0.0	Pass
		36.4	36.4	0.0	Pass
		54.3	54.3	0.0	Pass
3c	10	0.6	0.6	0.0	Pass
		4.2	4.2	0.0	Pass
		10.1	10.1	0.0	Pass
		18.5	18.5	0.0	Pass
		36.4	36.4	0.0	Pass
		54.3	54.3	0.0	Pass
4	10	0.6	0.6	0.0	Pass
		4.2	4.2	0.0	Pass
		10.1	10.1	0.0	Pass
		18.5	18.5	0.0	Pass
		36.4	36.4	0.0	Pass
		54.3	54.3	0.0	Pass
5	10	0.6	0.6	0.0	Pass
		4.2	4.2	0.0	Pass
		10.1	10.1	0.0	Pass
		18.5	18.5	0.0	Pass
		36.4	36.4	0.0	Pass
		54.3	54.3	0.0	Pass

Table 2-6. Temperature Audit Results

Site Number	Sensor Height (Meters)	Reference Temperature (°C)	Sensor Reading (°C)	Measurement Error (°C) (Criteria $\pm 1.0^\circ \text{C}$)	Pass / Fail
1	1.1	31.1	31.2	0.1	Pass
		29.3	29.8	0.5	Pass
2	1.1	32.6	31.9	-0.7	Pass
		32.1	31.8	-0.3	Pass
3c	1.1	30.1	29.5	-0.6	Pass
		30.1	30.0	-0.1	Pass
4	1.1	30.9	30.4	-0.5	Pass
		31.0	30.3	-0.7	Pass
5	1.1	32.9	32.8	-0.1	Pass
		32.6	31.8	-0.8	Pass

Table 2-7. Barometric Pressure Audit Results

Site Number	Sensor Height (Meters)	Reference Pressure (mm/Hg)	Sensor Reading (mm/Hg)	Measurement Error (mm/Hg) (Criteria $\pm 7.6 \text{ mm/Hg}$)	Pass / Fail
1	1.1	740	741	1.0	Pass
		740	741	1.0	Pass
2	1.1	741	741	0.0	Pass
		741	741	0.0	Pass
3c	1.1	737	738	1.0	Pass
		737	738	1.0	Pass
4	1.1	737	738	1.0	Pass
		737	738	1.0	Pass
5	1.1	736	737	1.0	Pass
		736	737	1.0	Pass

Table 2-8. Precipitation Audit Results

Site Number	Sensor Height (Meters)	Input Volume (Inches)	Sensor Reading (Inches)	Measurement Error (%) (Criteria $\pm 10\%$)	Pass / Fail
1	0.6	.10	.10	0.0	Pass
2	0.6	.10	.09	-10.0	Pass
3c	0.6	.10	.09	-10.0	Pass
4	0.6	.10	.09	-10.0	Pass
5	0.6	.10	.14	40.0	Failed

3.0 Discussions and Recommendations

This section focuses on concerns identified during the audit. An audit concern can be a performance audit results that does not meet the criteria, or a technical systems audit result of any condition that may adversely affect quality. Three categories are used to rank the audit concerns critical, major and minor. Each level of concern is defined in the following paragraphs, along with an explanation of any audit issues that are so categorized. General recommendations for corrective actions are listed at the end of the section, where applicable. Appended to this report are the field data worksheets (Appendix A), audit equipment traceability (Appendix B) and corrective action reports (Appendix C).

3.1 Critical Concerns

Critical concerns are situations that will adversely impact data quality and have a significant effect on successful project operations. Nonconforming audit results that indicate measurements out of quality control requirements are classified as critical concerns. These concerns require immediate action to ensure that the measurement quality will return to in-control conditions. Critical concerns must be addressed and corrective action documented and reported to the project team. Based on the results of this audit, no critical concerns were identified.

3.2 Major Concerns

Major concerns may not immediately affect successful project operations, but may potentially impact data quality and could lead to data invalidation. Measurement systems outside the audit objective are usually classified as major concerns. A written response normally is required for major concerns so that acknowledgment of the problem and a corrective action plan can be communicated and implemented effectively. Based on the results of this audit, no major concerns were identified.

3.3 Minor Concerns

Minor concerns are typically based on observed inconsistencies in implementation of procedures, or performance audit results that indicate potential for future problems. Data validity is not compromised, but a degree of inefficiency or the beginning of a larger problem could result from these situations. Based on the results of this audit, one minor concern was identified as discussed below.

During the audit of the rain gauge at site 5 it was observed that the responses were biased high forty percent. With a known input of 0.10 inches the rain gauge yielded a response of 0.14

inches. The rain gauge has a dual chambered tipping mechanism that pours when one side is full and produces a signal response for the measured amount. It was observed during the audit that when tipped, one of the chambers would bounce producing a second erroneous response thus contributing to the bias. The Midlothian monitoring program QAPP doesn't specify measurement criteria for rainfall amount only for rainfall duration. Therefore no corrective action report was generated for this finding.

4.0 Response Requirements

As project manager, Al Hendler is responsible for coordinating a response to this audit report. Any critical and major concerns, if identified, require a specific written response detailing action taken or planned to resolve the concern and prevent reoccurrence. A written response should include specific action taken or planned to resolve the concern and prevent reoccurrence. Each written response enables the auditor to document the resolution of any concern and close the audit.

APPENDIX A

Field Data Worksheets



Wind Direction Audit Data Sheet (360 Sensor)

Site ID: Midlothian CAMS 52(Site 1)
 Date: June 30, 2009
 Time: 1015-1040 CDT
 Sensor ID: Met One 020 C
 Serial #: C3624

Tower Height: 10 Meters
 Sensor Level: yes
 Vane Condition: good
 Bearing Condition: good
 Last Field Calibration: n/a

Audit Device: Compass Transit
 Model: Lietz 115
 Serial #: 32100
 Cert. Expiration: November 18, 2009
 Linearity Device: Met One Degree Wheel
 Serial #: 1

Reference Angle (deg)	Sensor Rotation	Sensor Response (deg)	Measurement Error (deg)	Hysteresis Error (deg)	Normalized Linearity Error (deg)	Average Error (deg)	Total Error (deg)
0	CW	0.38	0.38		0.90		
30	CW	29.22	-0.78		-0.26		
60	CW	58.50	-1.50		-0.98		
90	CW	88.80	-1.20		-0.68		
120	CW	119.10	-0.90		-0.38		
150	CW	149.60	-0.40		0.12		
180	CW	179.90	-0.10		0.42		
210	CW	210.10	0.10		0.62		
240	CW	239.50	-0.50		0.02		
270	CW	269.20	-0.80		-0.28		
300	CW	298.80	-1.20		-0.68		
330	CW	328.40	-1.60		-1.08		
360	CCW	0.38	0.38	0.00	0.90	0.90	-0.50
330	CCW	328.90	-1.10	0.50	-0.58	-0.83	-2.23
300	CCW	298.90	-1.10	0.10	-0.58	-0.63	-2.03
270	CCW	269.50	-0.50	0.30	0.02	-0.13	-1.53
240	CCW	239.90	-0.10	0.40	0.42	0.22	-1.18
210	CCW	210.40	0.40	0.30	0.92	0.77	-0.63
180	CCW	180.30	0.30	0.20	0.82	0.62	-0.78
150	CCW	149.90	-0.10	0.30	0.42	0.27	-1.13
120	CCW	119.90	-0.10	0.80	0.42	0.02	-1.38
90	CCW	89.30	-0.70	0.50	-0.18	-0.43	-1.83
60	CCW	59.44	-0.56	0.94	-0.04	-0.51	-1.91
30	CCW	29.23	-0.77	0.01	-0.25	-0.26	-1.66
Mean:			-0.52	0.36			
Maximum Hysteresis Error :				0.94			
Maximum Normalized Linearity Error :					-1.08		
Specification : +/- 3 degrees							
Maximum Total Error :							-2.23
Specification : +/- 5 degrees							

True North Alignment

Known Declination:	4.4 EMD
Expected Magnetic Compass Reading for True North:	355.6 Degrees
Actual Magnetic Compass Reading w/ Vane Aligned to 180/360:	357 Degrees
Alignment Error:	-1.40 Degrees
Data Correction:	None
Alignment Correction:	None
Action Taken	
Alignment meets specification. No action required.	

Specification : +/- 2 degrees

Auditor : Darrin Barton

Notes :

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Horizontal Wind Speed Audit Data Sheet

Site ID: Midlothian CAMS 52(Site 1)
Date: June 30, 2009
Time: 1015-1040 CDT
Sensor ID: Met One 010 C
Serial #: A1796

Tower Height: 10 Meters
Sensor Level: yes
Cup Condition: good
Bearing Check: 0.2 g-cm CCW
0.2 g-cm CW
Last Field Calibration: n/a

Audit Device: Anemometer Drive
Model: RM Young 18811
Serial #: CAO1723
Cert. Expiration: March 20, 2010
Torque Device: RM Young Torque Disc
Serial #: 2

Audit Input CCW (rpm)	Known Input Value (m/h)	Sensor Response (m/h)	Measurement Error (m/h)	Audit Input CW (rpm)	Known Input Value (m/h)	Sensor Response (m/h)	Measurement Error (m/h)
0	0.6	0.6	0.0	0	0.6	0.6	0.0
60	4.2	4.2	0.0	60	4.2	4.2	0.0
160	10.1	10.1	0.0	160	10.1	10.1	0.0
300	18.5	18.5	0.0	300	18.5	18.5	0.0
600	36.4	36.4	0.0	600	36.4	36.4	0.0
900	54.3	54.3	0.0	900	54.3	54.3	0.0

Specification: +/- 0.4

Specification: +/- 0.4

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Temperature Audit Data Sheet

Site ID: Midlothian CAMS 52(Site 1)
Date: June 30, 2009
Time: 945-1000 CDT
Sensor ID: Met One 060A-2
Serial #: G3468

Sensor Height: 3.5'
Sensor Condition: good
Sensor Level: yes
Aspirator Condition: working
Last Field Calibration: n/a

Audit Device: Digital Thermometer
Model: VWR
Serial #: 230058352
Cert. Expiration: July 29, 2009

Time of the Audit	Type of Comparison	Audit Reference Temperature (deg C)	Station Probe Temperature (deg C)	Measurement Error (deg C)
945	Collocated Measurement	31.10	31.2	0.1
1000	Collocated Measurement	29.3	29.8	0.5

Specification: +/- 1.0

Auditor: Darrin Barton

Notes:

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Precipitation Audit Data Sheet

Site ID: Midlothian CAMS 52(Site 1)

Date: June 30, 2009

Time: 950 CDT

Sensor ID: Met One

Serial #: X6391

Sensor Height: 2 inches

Sensor Condition: good

Sensor Level: yes

Sensor Clean: yes

Last Field Calibration: n/a

Audit Device: Acrylic Buret

Model: Cole Parmer

Serial #: 2

Cert. Expiration: none

Time of the Audit	Input Volume (mL)	Gauge Input (inches)	Response (inches)	Measurement Error (%)
950	80.0	0.10	0.10	0.0%

Specification: +/- 10.0

Auditor : Darrin Barton

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Notes:

Barometric Pressure Audit Data Sheet

Site ID: Midlothian CAMS 52(Site 1)
Date: June 30, 2009
Time: 945-1000 CDT
Sensor ID: Vaisala
Serial #: unknown

Sensor Height: 3.5'
Sensor Condition: good
Sensor Level: yes
Last Field Calibration: n/a

Audit Device: Barometer/Altimeter
Model: Airs-Vaisala
Serial #: OF1475
Cert. Expiration: April 15, 2010

Time of the Audit	Type of Comparison	Audit Reference Barometric Pressure (mmHg)	Site Sensor Barometric Pressure (mmHg)	Measurement Error (mmHg)
945	Collocated Measurement	740.0	741.0	1.0
1000	Collocated Measurement	740.0	741.0	1.0

Specification: +/- 7.6

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Notes:

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PM₁₀ / VOLUMETRIC FLOW CONTROL (VFC) PERFORMANCE AUDIT DATA

Site ID: Midlothian CAMS 52(Site 1)
Date: June 30, 2009
Time: 930-940 CDT
Pressure (P_a) (mm Hg): 740.0
Temperature (T_a) (F): 88.0
Temperature (T_a) (C): 31.1

Audit Device: Variable Orifice
Serial #: W-90
Slope: 0.96956
Intercept: 0.00007
Correlation: 0.99996
Cert. Exp. Date: September 30, 2009

PM ₁₀ AUDIT DATA						
Sampler ID#	Audit Pressure Drop (ΔH) ("H ₂ O)	Stagnation Pressure (ΔP _{STG}) ("H ₂ O)	Audit Flow (Q _a) (m ³ /min)	Sampler Flow ¹ (Q _s) (m ³ /min)	Percent Difference ² (Sampler vs. Audit)	Percent Difference ³ (Audit vs. Design)
580	2.90	19.2	1.126	1.152	2.4%	-0.4%
675	2.90	19.2	1.126	1.131	0.5%	-0.4%

1. From Sampler Look-Up Table or Calibration Data
2. Acceptance Criteria: ±7%
3. Acceptance Criteria: ±10%

SAMPLER CALIBRATION DATA					
Sampler ID#	Pressure Ratio (P _i /P _a) (mm Hg)	Calibration Date	Sampler Slope	Sampler Intercept	Sampler Correlation
580	0.9515	11/19/08	12.2996	0.1387	1.0000
675	0.9515	11/19/08	12.0731	0.1683	1.0000

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Notes:

Cr⁶⁺ Sampler
PERFORMANCE AUDIT DATA

Site ID: Midlothian CAMS 52(Site 1)
Date: June 30, 2009
Time: 1000-1015 CDT
ANALYZER ID: ERG CR6-15
Serial #: 15.0

Audit Flow Meter : BGI
Model No : deltaCal
Serial No : 579
Cert. Exp. Date : 9/5/2009

Sample Inlet Flow Audit Data		
Designed Flow Rate (LPM)	Measured Flow Rate	Percent Difference ₂
	(LPM)	
15	15.66	4.40%
15	15.86	5.73%

2. Acceptance Criteria: $\pm 10\%$

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Notes:

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Wind Direction Audit Data Sheet (360 Sensor)

Site ID: Midlothian Old CAMS 302(Site 2)
 Date: June 30, 2009
 Time: 1125-1155 CDT
 Sensor ID: Met One 020 B
 Serial #: J3045

Tower Height: 10 Meters
 Sensor Level: yes
 Vane Condition: good
 Bearing Condition: good
 Last Field Calibration: n/a

Audit Device: Compass Transit
 Model: Lietz 115
 Serial #: 32100
 Cert. Expiration: November 18, 2009
 Linearity Device: Met One Degree Wheel
 Serial #: 1

Reference Angle (deg)	Sensor Rotation	Sensor Response (deg)	Measurement Error (deg)	Hysteresis Error (deg)	Normalized Linearity Error (deg)	Average Error (deg)	Total Error (deg)
0	CW	0.28	0.28		0.92		
30	CW	29.40	-0.60		0.04		
60	CW	60.40	0.40		1.04		
90	CW	89.80	-0.20		0.44		
120	CW	119.70	-0.30		0.34		
150	CW	149.30	-0.70		-0.06		
180	CW	180.10	0.10		0.74		
210	CW	210.10	0.10		0.74		
240	CW	239.60	-0.40		0.24		
270	CW	268.60	-1.40		-0.76		
300	CW	298.00	-2.00		-1.36		
330	CW	327.50	-2.50		-1.86		
360	CCW	0.28	0.28	0.00	0.92	0.92	-0.48
330	CCW	327.30	-2.70	0.20	-2.06	-1.96	-3.36
300	CCW	298.00	-2.00	0.00	-1.36	-1.36	-2.76
270	CCW	268.60	-1.40	0.00	-0.76	-0.76	-2.16
240	CCW	239.60	-0.40	0.00	0.24	0.24	-1.16
210	CCW	210.10	0.10	0.00	0.74	0.74	-0.66
180	CCW	180.00	0.00	0.10	0.64	0.69	-0.71
150	CCW	149.30	-0.70	0.00	-0.06	-0.06	-1.46
120	CCW	119.80	-0.20	0.10	0.44	0.39	-1.01
90	CCW	90.40	0.40	0.20	1.04	0.74	-0.66
60	CCW	59.20	-0.80	0.40	-0.16	0.44	-0.96
30	CCW	29.20	-0.80	0.20	-0.16	-0.06	-1.46
Mean:			-0.64	0.10			
Maximum Hysteresis Error :				0.40			
Maximum Normalized Linearity Error :					-2.06		
Specification : +/- 3 degrees							
Maximum Total Error :							-3.36
Specification : +/- 5 degrees							

True North Alignment

Known Declination:	4.4 EMD
Expected Magnetic Compass Reading for True North:	355.6 Degrees
Actual Magnetic Compass Reading w/ Vane Aligned to 180/360:	357 Degrees
Alignment Error:	-1.40 Degrees
Data Correction:	None
Alignment Correction:	None
Action Taken	
Alignment meets specification. No action required.	

Specification : +/- 2 degrees

Auditor : Darrin Barton

Notes :

URS

Rev. 8.7 (3/08)

Horizontal Wind Speed Audit Data Sheet

Site ID: Midlothian Old CAMS 302(Site 2)
Date: June 30, 2009
Time: 1125-1155 CST
Sensor ID: Met One 010 B
Serial #: P1085

Tower Height: 10 Meters
Sensor Level: yes
Cup Condition: good
Bearing Check:

0.2 g-cm CCW
 0.2 g-cm CW

Last Field Calibration: n/a

Audit Device: Anemometer Drive
Model: RM Young 18811
Serial #: CAO1723
Cert. Expiration: March 20, 2010
Torque Device: RM Young Torque Disc
Serial #: 2

Audit Input CCW (rpm)	Known Input Value (m/h)	Sensor Response (m/h)	Measurement Error (m/h)	Audit Input CW (rpm)	Known Input Value (m/h)	Sensor Response (m/h)	Measurement Error (m/h)
0	0.6	0.6	0.0	0	0.6	0.6	0.0
60	4.2	4.2	0.0	60	4.2	4.2	0.0
160	10.1	10.1	0.0	160	10.1	10.1	0.0
300	18.5	18.5	0.0	300	18.5	18.5	0.0
600	36.4	36.4	0.0	600	36.4	36.4	0.0
900	54.3	54.3	0.0	900	54.3	54.3	0.0

Specification: +/- 0.4

Specification: +/- 0.4

Auditor: Darrin Barton

Notes:

URS
 Rev. 8.7 (3/08)

Temperature Audit Data Sheet

Site ID: Midlothian Old CAMS 302(Site 2)
Date: June 30, 2009
Time: 1120-1125 CDT
Sensor ID: Met One 060A-2
Serial #: unknown

Sensor Height: 3.5'
Sensor Condition: good
Sensor Level: yes
Aspirator Condition: working
Last Field Calibration: n/a

Audit Device: Digital Thermometer
Model: VWR
Serial #: 230058352
Cert. Expiration: July 29, 2009

Time of the Audit	Type of Comparison	Audit Reference Temperature (deg C)	Station Probe Temperature (deg C)	Measurement Error (deg C)
1120	Collocated Measurement	32.6	31.9	-0.7
1125	Collocated Measurement	32.1	31.8	-0.3

Specification: +/- 1.0

Auditor: Darrin Barton

Notes:

URS
Rev. 8.7 (3/08)

Precipitation Audit Data Sheet

Site ID: Midlothian Old CAMS 302(Site 2)

Date: June 30, 2009

Time: 1120 CDT

Sensor ID: Met One

Serial #: unknown

Sensor Height: 2 inches

Sensor Condition: good

Sensor Level: yes

Sensor Clean: yes

Last Field Calibration: n/a

Audit Device: Acrylic Buret

Model: Cole Parmer

Serial #: 2

Cert. Expiration: none

Time of the Audit	Input Volume (mL)	Gauge Input (Inches)	Response (Inches)	Measurement Error (%)
1120	80.0	0.10	0.09	-10.0%

Specification: +/- 10.0

URS

Rev. 8.7 (3/08)

Auditor : Darrin Barton

Notes:

Barometric Pressure Audit Data Sheet

Site ID: Midlothian Old CAMS 302(Site 2)

Date: June 30, 2009

Time: 1120-1125 CDT

Sensor ID: Vaisala

Serial #: unknown

Sensor Height: 3.5'

Sensor Condition: good

Sensor Level: yes

Last Field Calibration: n/a

Audit Device: Barometer/Altimeter

Model: Ahrs-Vaisala

Serial #: OF1475

Cert. Expiration: April 15, 2010

Time of the Audit	Type of Comparison	Audit Reference Barometric Pressure (mmHg)	Site Sensor Barometric Pressure (mmHg)	Measurement Error (mmHg)
1120	Collocated Measurement	741.0	741.0	0.0
1125	Collocated Measurement	741.0	741.0	0.0

Specification: +/- 7.6

URS

Rev. 8.7 (3/08)

Auditor: Darrin Barton

Notes:

**PM₁₀ / VOLUMETRIC FLOW CONTROL (VFC)
PERFORMANCE AUDIT DATA**

Site ID: Midlothian Old CAMS 302(Site 2)
 Date: June 30, 2009
 Time: 1055-1105 CDT
 Pressure (P_a) (mm Hg): 741.0
 Temperature (T_a) (F): 90.6
 Temperature (T_a) (C): 32.6

Audit Device: Variable Orifice
 Serial #: WV-90
 Slope: 0.96956
 Intercept: 0.00007
 Correlation: 0.99996
 Cert. Exp. Date: September 30, 2009

PM ₁₀ AUDIT DATA						
Sampler ID#	Audit Pressure Drop (ΔH) ("H ₂ O)	Stagnation Pressure (ΔP _{STG}) ("H ₂ O)	Audit Flow (Q _a) (m ³ /min)	Sampler Flow ¹ (Q _s) (m ³ /min)	Percent Difference ² (Sampler vs. Audit)	Percent Difference ³ (Audit vs. Design)
641	2.80	19.4	1.108	1.137	2.6%	-1.9%
582	2.80	19.5	1.108	1.116	0.7%	-1.9%

1. From Sampler Look-Up Table or Calibration Data
 2. Acceptance Criteria: ±7%
 3. Acceptance Criteria: ±10%

SAMPLER CALIBRATION DATA					
Sampler ID#	Pressure Ratio (P ₁ /P _a) (mm Hg)	Calibration Date	Sampler Slope	Sampler Intercept	Sampler Correlation
641	0.9511	02/25/09	12.1374	0.1619	1.0000
582	0.9509	03/09/09	11.8857	0.1920	1.0000

AUDITOR: Darrin Barton

Notes:

URS
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PM₁₀ / VOLUMETRIC FLOW CONTROL (VFC) PERFORMANCE AUDIT DATA

Site ID: Midlothian Old CAMS 302(Site 2)
Date: June 30, 2009
Time: 1055-1105 CDT
Pressure (P_a) (mm Hg): 741.0
Temperature (T_a) (F): 90.6
Temperature (T_a) (C): 32.6

Audit Device: Variable Orifice
Serial #: W-90
Slope: 0.96956
Intercept: 0.00007
Correlation: 0.99996
Cert. Exp. Date: September 30, 2009

PM ₁₀ AUDIT DATA						
Sampler ID#	Audit Pressure Drop (ΔH) ("H ₂ O)	Stagnation Pressure (ΔP _{STG}) ("H ₂ O)	Audit Flow (Q _a) (m ³ /min)	Sampler Flow ¹ (Q _s) (m ³ /min)	Percent Difference ² (Sampler vs. Audit)	Percent Difference ³ (Audit vs. Design)
726	2.80	19.5	1.108	1.151	3.8%	-1.9%

1. From Sampler Look-Up Table or Calibration Data

2. Acceptance Criteria: ±7%

3. Acceptance Criteria: ±10%

SAMPLER CALIBRATION DATA					
Sampler ID#	Pressure Ratio (P _t /P _a) (mm Hg)	Calibration Date	Sampler Slope	Sampler Intercept	Sampler Correlation
726	0.9509	02/25/09	12.2874	0.1419	1.0000

AUDITOR: Darrin Barton

Notes:

URS
 Rev. 8.7 (3/08)

Cr⁶⁺ Sampler
PERFORMANCE AUDIT DATA

Site ID: Midlothian Old CAMS 302(Site 2)
Date: June 30, 2009
Time: 1125-1135 CDT
ANALYZER ID: ERG CR6
Serial #: s/n 1 and s/n 24

Audit Flow Meter : BGI
Model No : deltaCal
Serial No : 579
Cert. Exp. Date : 9/5/2009

Sample Inlet Flow Audit Data		
Designed Flow Rate (LPM)	Measured Flow Rate (LPM)	Percent Difference ₂
15	15.59	3.93%
15	15.91	6.07%
15	15.89	5.93%

2. Acceptance Criteria: $\pm 10\%$

AUDITOR: Darrin Barton

Notes:

URS

Rev. 8.7 (3/08)

Wind Direction Audit Data Sheet (360 Sensor)

Site ID: Midlothian High School (Site 3c)
 Date: June 30, 2009
 Time: 1505-1600 CDT
 Sensor ID: Met One 020 C
 Serial #: Y2145

Tower Height: 10 Meters
 Sensor Level: yes
 Vane Condition: good
 Bearing Condition: good
 Last Field Calibration: n/a

Audit Device: Compass Transit
 Model: Lietz 115
 Serial #: 32100
 Cert. Expiration: November 18, 2009
 Linearity Device: Met One Degree Wheel
 Serial #: 1

Reference Angle (deg)	Sensor Rotation	Sensor Response (deg)	Measurement Error (deg)	Hysteresis Error (deg)	Normalized Linearity Error (deg)	Average Error (deg)	Total Error (deg)
0	CW	360.50	0.50		1.10		
30	CW	27.46	-2.54		-1.94		
60	CW	57.80	-2.20		-1.60		
90	CW	88.60	-1.40		-0.80		
120	CW	119.10	-0.90		-0.30		
150	CW	149.50	-0.50		0.10		
180	CW	179.80	-0.20		0.40		
210	CW	210.20	0.20		0.80		
240	CW	240.30	0.30		0.90		
270	CW	270.20	0.20		0.80		
300	CW	299.80	-0.20		0.40		
330	CW	329.60	-0.40		0.20		
360	CCW	360.60	0.60	0.10	1.20	1.15	-0.25
330	CCW	329.60	-0.40	0.00	0.20	0.20	-1.20
300	CCW	299.80	-0.20	0.00	0.40	0.40	-1.00
270	CCW	270.20	0.20	0.00	0.80	0.80	-0.60
240	CCW	240.30	0.30	0.00	0.90	0.90	-0.50
210	CCW	210.20	0.20	0.00	0.80	0.80	-0.60
180	CCW	179.80	-0.20	0.00	0.40	0.40	-1.00
150	CCW	149.60	-0.40	0.10	0.20	0.15	-1.25
120	CCW	119.00	-1.00	0.10	-0.40	-0.35	-1.75
90	CCW	88.60	-1.40	0.00	-0.80	-0.80	-2.20
60	CCW	57.80	-2.20	0.00	-1.60	-1.60	-3.00
30	CCW	27.30	-2.70	0.16	-2.10	-2.02	-3.42
Mean:			-0.60	0.04			
Maximum Hysteresis Error :				0.16			
Maximum Normalized Linearity Error :					-2.10		
Specification : +/- 3 degrees							
Maximum Total Error :							-3.42
Specification : +/- 5 degrees							

True North Alignment			
Known Declination:	4.4	EMD	
Expected Magnetic Compass Reading for True North:	355.6	Degrees	
Actual Magnetic Compass Reading w/ Vane Aligned to 180/360:	357	Degrees	
Alignment Error:	-1.40	Degrees	
Data Correction:	None		
Alignment Correction:	None		
Action Taken			
Alignment meets specification. No action required.			

Specification : +/- 2 degrees

Auditor : Darrin Barton

Notes :

URS

Rev. 8.7 (3/08)

Horizontal Wind Speed Audit Data Sheet

Site ID: Midlothian High School (Site 3c)
Date: June 30, 2009
Time: 1505-1600 CDT
Sensor ID: Met One 010 C
Serial #: C3636

Tower Height: 10 Meters
Sensor Level: yes
Cup Condition: good
Bearing Check:

0.2 g-cm CCW
 0.2 g-cm CW

Last Field Calibration: n/a

Audit Device: Anemometer Drive
Model: RM Young 18811
Serial #: CAO1723
Cert. Expiration: March 20, 2010
Torque Device: RM Young Torque Disc
Serial #: 2

Audit Input CCW (rpm)	Known Input Value (m/h)	Sensor Response (m/h)	Measurement Error (m/h)	Audit Input CW (rpm)	Known Input Value (m/h)	Sensor Response (m/h)	Measurement Error (m/h)
0	0.6	0.6	0.0	0	0.6	0.6	0.0
60	4.2	4.2	0.0	60	4.2	4.2	0.0
160	10.1	10.1	0.0	160	10.1	10.1	0.0
300	18.5	18.5	0.0	300	18.5	18.5	0.0
600	36.4	36.4	0.0	600	36.4	36.4	0.0
900	54.3	54.3	0.0	900	54.3	54.3	0.0

Specification: +/- 0.4

Specification: +/- 0.4

Auditor: Darrin Barton

Notes:

URS
 Rev. 8.7 (3/08)

Temperature Audit Data Sheet

Site ID: Midlothian High School (Site 3c)
Date: June 30, 2009
Time: 1500-1505 CDT
Sensor ID: Met One 060A-2
Serial #: G7946

Sensor Height: 3.5'
Sensor Condition: good
Sensor Level: yes
Aspirator Condition: working
Last Field Calibration: n/a

Audit Device: Digital Thermometer
Model: VWR
Serial #: 230058352
Cert. Expiration: July 29, 2009

Time of the Audit	Type of Comparison	Audit Reference Temperature (deg C)	Station Probe Temperature (deg C)	Measurement Error (deg C)
1500	Collocated Measurement	30.1	29.5	-0.6
1505	Collocated Measurement	30.1	30.0	-0.1

Specification: +/- 1.0

Auditor: Darrin Barton

Notes:

URS
Rev. 8.7 (3/08)

Precipitation Audit Data Sheet

Site ID: Midlothian High School (Site 3c)
Date: June 30, 2009
Time: 1505 CDT
Sensor ID: Met One
Serial #: B2029

Sensor Height: 2 inches
Sensor Condition: good
Sensor Level: yes
Sensor Clean: yes
Last Field Calibration: n/a

Audit Device: Acrylic Buret
Model: Cole Parmer
Serial #: 2
Cert. Expiration: none

Time of the Audit	Input Volume (mL)	Gauge Input (inches)	Response (inches)	Measurement Error (%)
1505	80.0	0.10	0.09	-10.0%

Specification: +/- 10.0

URS

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Auditor : Darrin Barton

Notes:

Barometric Pressure Audit Data Sheet

Site ID: Midlothian High School (Site 3c)
Date: June 30, 2009
Time: 1500-1505 CDT
Sensor ID: Vaisala
Serial #: unknown

Sensor Height: 3.5'
Sensor Condition: good
Sensor Level: yes
Last Field Calibration: n/a

Audit Device: Barometer/Altimeter
Model: Airs-Vaisala
Serial #: OF1475
Cert. Expiration: April 15, 2010

Time of the Audit	Type of Comparison	Audit Reference Barometric Pressure (mmHg)	Site Sensor Barometric Pressure (mmHg)	Measurement Error (mmHg)
1500	Collocated Measurement	737.0	738.0	1.0
1505	Collocated Measurement	737.0	738.0	1.0

Specification: +/- 7.6

URS

Rev. 8.7 (3/08)

Auditor: Darrin Barton

Notes:

PM₁₀ / VOLUMETRIC FLOW CONTROL (VFC) PERFORMANCE AUDIT DATA

Site ID: Midlothian High School (Site 3c)
Date: June 30, 2009
Time: 1440-1450 CDT
Pressure (P_a) (mm Hg): 737.0
Temperature (T_a) (F): 86.2
Temperature (T_a) (C): 30.1

Audit Device: Variable Orifice
Serial #: W-90
Slope: 0.96956
Intercept: 0.00007
Correlation: 0.99996
Cert. Exp. Date: September 30, 2009

PM ₁₀ AUDIT DATA						
Sampler ID#	Audit Pressure Drop (ΔH) ("H ₂ O)	Stagnation Pressure (ΔP _{STG}) ("H ₂ O)	Audit Flow (Q _a) (m ³ /min)	Sampler Flow ¹ (Q _a) (m ³ /min)	Percent Difference ² (Sampler vs. Audit)	Percent Difference ³ (Audit vs. Design)
6673	2.80	19.4	1.107	1.113	0.6%	-2.1%
6671	2.80	19.3	1.107	1.128	1.9%	-2.1%

1. From Sampler Look-Up Table or Calibration Data

2. Acceptance Criteria: ±7%

3. Acceptance Criteria: ±10%

SAMPLER CALIBRATION DATA					
Sampler ID#	Pressure Ratio (P _s /P _a) (mm Hg)	Calibration Date	Sampler Slope	Sampler Intercept	Sampler Correlation
6673	0.9508	11/20/08	11.9097	0.1892	1.0000
6671	0.9511	11/20/08	12.0629	0.1696	1.0000

AUDITOR: Darrin Barton

URS
 Rev. 8.7 (3/08)

Notes:

Cr⁶⁺ Sampler
PERFORMANCE AUDIT DATA

Site ID: Midlothian High School (Site 3c)
Date: June 30, 2009
Time: 1450-1500
ANALYZER ID: ERG CR6
Serial #: 9.0

Audit Flow Meter : BGI
Model No : deltaCal
Serial No : 579
Cert. Exp. Date : 9/5/2009

Sample Inlet Flow Audit Data		
Designed Flow Rate (LPM)	Measured Flow Rate	Percent Difference ₂
	(LPM)	
15	14.82	-1.20%
15	15.79	5.27%

2. Acceptance Criteria: $\pm 10\%$

AUDITOR: Darrin Barton

Notes:

URS

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Wind Direction Audit Data Sheet (360 Sensor)

Site ID: Midlothian Jaycee Park (Site 4)
 Date: June 30, 2009
 Time: 1350-1415 CDT
 Sensor ID: Met One 020 B
 Serial #: H7308

Tower Height: 10 Meters
 Sensor Level: yes
 Vane Condition: good
 Bearing Condition: good
 Last Field Calibration: n/a

Audit Device: Compass Transit
 Model: Lietz 115
 Serial #: 32100
 Cert. Expiration: November 18, 2009
 Linearity Device: Met One Degree Wheel
 Serial #: 1

Reference Angle (deg)	Sensor Rotation	Sensor Response (deg)	Measurement Error (deg)	Hysteresis Error (deg)	Normalized Linearity Error (deg)	Average Error (deg)	Total Error (deg)
0	CW	358.40	-1.60		-0.63		
30	CW	27.00	-3.00		-2.03		
60	CW	57.00	-3.00		-2.03		
90	CW	87.50	-2.50		-1.53		
120	CW	118.60	-1.40		-0.43		
150	CW	149.50	-0.50		0.47		
180	CW	180.50	0.50		1.47		
210	CW	211.00	1.00		1.97		
240	CW	240.80	0.80		1.77		
270	CW	270.30	0.30		1.27		
300	CW	299.20	-0.80		0.17		
330	CW	328.80	-1.20		-0.23		
360	CCW	358.00	-2.00	0.40	-1.03	-0.83	-2.73
330	CCW	328.80	-1.20	0.00	-0.23	-0.23	-2.13
300	CCW	299.10	-0.90	0.10	0.07	0.12	-1.78
270	CCW	270.20	0.20	0.10	1.17	1.22	-0.68
240	CCW	240.90	0.90	0.10	1.87	1.82	-0.08
210	CCW	211.20	1.20	0.20	2.17	2.07	0.17
180	CCW	180.30	0.30	0.20	1.27	1.37	-0.53
150	CCW	149.30	-0.70	0.20	0.27	0.37	-1.53
120	CCW	118.50	-1.50	0.10	-0.53	-0.48	-2.38
90	CCW	87.90	-2.10	0.40	-1.13	-1.33	-3.23
60	CCW	57.00	-3.00	0.00	-2.03	-2.03	-3.93
30	CCW	27.00	-3.00	0.00	-2.03	-2.03	-3.93
Mean:			-0.97	0.15			
Maximum Hysteresis Error :				0.40			
Maximum Normalized Linearity Error :					2.17		
Specification : +/- 3 degrees							
Maximum Total Error :							-3.93
Specification : +/- 5 degrees							

True North Alignment			
Known Declination:	4.4	EMD	
Expected Magnetic Compass Reading for True North:	355.6	Degrees	
Actual Magnetic Compass Reading w/ Vane Aligned to 180/360:	357.5	Degrees	
Alignment Error:	-1.90	Degrees	
Data Correction:	None		
Alignment Correction:	None		
Action Taken			
Alignment meets specification. No action required.			

Specification : +/- 2 degrees

Auditor : Darrin Barton

Notes :

URS

Rev. 8.7 (3/08)

Horizontal Wind Speed Audit Data Sheet

Site ID: Midlothian Jaycee Park (Site 4)
Date: June 30, 2009
Time: 1350-1415 CDT
Sensor ID: Met One 010 B
Serial #: unknown

Tower Height: 10 Meters
Sensor Level: yes
Cup Condition: good
Bearing Check:

0.2 g-cm CCW
0.2 g-cm CW

Last Field Calibration: n/a

Audit Device: Anemometer Drive
Model: RM Young 18811
Serial #: CAO1723
Cert. Expiration: March 20, 2010
Torque Device: RM Young Torque Disc
Serial #: 2

Audit Input CCW (rpm)	Known Input Value (m/h)	Sensor Response (m/h)	Measurement Error (m/h)	Audit Input CW (rpm)	Known Input Value (m/h)	Sensor Response (m/h)	Measurement Error (m/h)
0	0.6	0.6	0.0	0	0.6	0.6	0.0
60	4.2	4.2	0.0	60	4.2	4.2	0.0
160	10.1	10.1	0.0	160	10.1	10.1	0.0
300	18.5	18.5	0.0	300	18.5	18.5	0.0
600	36.4	36.4	0.0	600	36.4	36.4	0.0
900	54.3	54.3	0.0	900	54.3	54.3	0.0

Specification: +/- 0.4

Specification: +/- 0.4

Auditor: Darrin Barton

Notes:

URS
Rev. 8.7 (3/08)

Temperature Audit Data Sheet

Site ID: Midlothian Jaycee Park (Site 4)
Date: June 30, 2009
Time: 1345-1350 CDT
Sensor ID: Met One 060A-2
Serial #: unknown

Sensor Height: 3.5'
Sensor Condition: good
Sensor Level: yes
Aspirator Condition: working
Last Field Calibration: n/a

Audit Device: Digital Thermometer
Model: VWR
Serial #: 230058352
Cert. Expiration: July 29, 2009

Time of the Audit	Type of Comparison	Audit Reference Temperature (deg C)	Station Probe Temperature (deg C)	Measurement Error (deg C)
1345	Collocated Measurement	30.9	30.4	-0.5
1350	Collocated Measurement	31	30.3	-0.7

Specification: +/- 1.0

Auditor: Darrin Barton

Notes:

URS

Rev. 8.7 (3/08)

Precipitation Audit Data Sheet

Site ID: Midlothian Jaycee Park (Site 4)
Date: June 30, 2009
Time: 1345 CDT
Sensor ID: Met One
Serial #: unknown

Sensor Height: 2 inches
Sensor Condition: good
Sensor Level: yes
Sensor Clean: yes
Last Field Calibration: n/a

Audit Device: Acrylic Buret
Model: Cole Parmer
Serial #: 2
Cert. Expiration: none

Time of the Audit	Input Volume (mL)	Gauge Input (inches)	Response (inches)	Measurement Error (%)
1345	80.0	0.10	0.09	-10.0%

Specification: +/- 10.0

Auditor : Darrin Barton

URS

Rev. 8.7 (3/08)

Notes:

Barometric Pressure Audit Data Sheet

Site ID: Midlothian Jaycee Park (Site 4)

Date: June 30, 2009

Time: 1345-1350 CDT

Sensor ID: Vaisala

Serial #: unknown

Sensor Height: 3.5'

Sensor Condition: good

Sensor Level: yes

Last Field Calibration: n/a

Audit Device: Barometer/Altimeter

Model: Airs-Vaisala

Serial #: OF1475

Cert. Expiration: April 15, 2010

Time of the Audit	Type of Comparison	Audit Reference Barometric Pressure (mmHg)	Site Sensor Barometric Pressure (mmHg)	Measurement Error (mmHg)
1345	Collocated Measurement	737.0	738.0	1.0
1350	Collocated Measurement	737.0	738.0	1.0

Specification: +/- 7.6

URS

Rev. 8.7 (3/08)

Auditor: Darrin Barton

Notes:

PM₁₀ / VOLUMETRIC FLOW CONTROL (VFC) PERFORMANCE AUDIT DATA

Site ID: Midlothian Jaycee Park (Site 4)
Date: June 30, 2009
Time: 1330-1340 CDT
Pressure (P_a) (mm Hg): 737.0
Temperature (T_a) (F): 87.6
Temperature (T_a) (C): 30.9

Audit Device: Variable Orifice
Serial #: W-90
Slope: 0.96956
Intercept: 0.00007
Correlation: 0.99996
Cert. Exp. Date: September 30, 2009

PM ₁₀ AUDIT DATA						
Sampler ID#	Audit Pressure Drop (ΔH) ("H ₂ O)	Stagnation Pressure (ΔP _{STG}) ("H ₂ O)	Audit Flow (Q _a) (m ³ /min)	Sampler Flow ¹ (Q _s) (m ³ /min)	Percent Difference ² (Sampler vs. Audit)	Percent Difference ³ (Audit vs. Design)
6670	2.80	19.4	1.108	1.129	1.9%	-1.9%
6672	2.80	19.5	1.108	1.136	2.5%	-1.9%

1. From Sampler Look-Up Table or Calibration Data
2. Acceptance Criteria: ±7%
3. Acceptance Criteria: ±10%

SAMPLER CALIBRATION DATA					
Sampler ID#	Pressure Ratio (P ₁ /P _a) (mm Hg)	Calibration Date	Sampler Slope	Sampler Intercept	Sampler Correlation
6670	0.9508	11/20/08	12.0629	0.1696	1.0000
6672	0.9506	11/20/08	12.1388	0.1598	1.0000

AUDITOR: Darrin Barton

Notes:

URS
 Rev. 8.7 (3/08)

Cr⁶⁺ Sampler
PERFORMANCE AUDIT DATA

Site ID: Midlothian Jaycee Park (Site 4)
Date: June 30, 2009
Time: 1340-1350 CDT
ANALYZER ID: ERG CR6
Serial #: 16.0

Audit Flow Meter : BGI
Model No : deltaCal
Serial No : 579
Cert. Exp. Date : 9/5/2009

Sample Inlet Flow Audit Data		
Designed Flow Rate (LPM)	Measured Flow Rate (LPM)	Percent Difference ₂
15	15.8	5.33%
15	15.9	6.00%

2. Acceptance Criteria: $\pm 10\%$

AUDITOR: Darrin Barton

Notes:

URS

Rev. 8.7 (3/08)

Wind Direction Audit Data Sheet (360 Sensor)

Site ID: Midlothian Water Treatment Plant(Site 5)
 Date: June 30, 2009
 Time: 1250-1315 CDT
 Sensor ID: Met One 020 B
 Serial #: K3069

Tower Height: 10 Meters
 Sensor Level: yes
 Vane Condition: good
 Bearing Condition: good
 Last Field Calibration: n/a

Audit Device: Compass Transit
 Model: Lietz 115
 Serial #: 32100
 Cert. Expiration: November 18, 2009
 Linearity Device: Met One Degree Wheel
 Serial #: 1

Reference Angle (deg)	Sensor Rotation	Sensor Response (deg)	Measurement Error (deg)	Hysteresis Error (deg)	Normalized Linearity Error (deg)	Average Error (deg)	Total Error (deg)
0	CW	1.00	1.00		-0.26		
30	CW	30.60	0.60		-0.66		
60	CW	60.70	0.70		-0.56		
90	CW	91.70	1.70		0.44		
120	CW	121.50	1.50		0.24		
150	CW	150.80	0.80		-0.46		
180	CW	180.70	0.70		-0.56		
210	CW	212.00	2.00		0.74		
240	CW	240.00	0.00		-1.26		
270	CW	269.00	-1.00		-2.26		
300	CW	300.00	0.00		-1.26		
330	CW	329.60	-0.40		-1.66		
360	CCW	0.40	0.40	0.60	-0.86	-0.56	-0.46
330	CCW	331.00	1.00	0.60	-0.26	-0.96	-0.86
300	CCW	301.40	1.40	1.40	0.14	-0.56	-0.46
270	CCW	271.50	1.50	0.50	0.24	-1.01	-0.91
240	CCW	241.00	1.00	1.00	-0.26	-0.76	-0.66
210	CCW	211.00	1.00	1.00	-0.26	0.24	0.34
180	CCW	182.10	2.10	1.40	0.84	0.14	0.24
150	CCW	152.30	2.30	1.50	1.04	0.29	-0.39
120	CCW	123.20	3.20	1.70	1.94	1.09	1.19
90	CCW	93.60	3.60	1.90	2.34	1.39	1.49
60	CCW	62.80	2.80	2.10	1.54	0.49	0.59
30	CCW	32.30	2.30	1.70	1.04	0.19	0.29
Mean:			1.26	1.28			
Maximum Hysteresis Error :				2.10			
Maximum Normalized Linearity Error :					2.34		
Specification : +/- 3 degrees							
Maximum Total Error :							1.49
Specification : +/- 5 degrees							

True North Alignment

Known Declination:	4.4 EMD
Expected Magnetic Compass Reading for True North:	355.6 Degrees
Actual Magnetic Compass Reading w/ Vane Aligned to 180/360:	355.5 Degrees
Alignment Error:	0.10 Degrees
Data Correction:	None
Alignment Correction:	None
Action Taken	
Alignment meets specification. No action required.	

Specification : +/- 2 degrees

Auditor : Darrin Barton

Notes :

URS

Rev. 8.7 (3/08)

Horizontal Wind Speed Audit Data Sheet

Site ID: Midlothian Water Treatment Plant(Site 5)
Date: June 30, 2009
Time: 1250-1315 CDT
Sensor ID: Met One 010 B
Serial #: G1380

Tower Height: 10 Meters
Sensor Level: yes
Cup Condition: good
Bearing Check:

0.2 g-cm CCW
 0.2 g-cm CW

Last Field Calibration: n/a

Audit Device: Anemometer Drive
Model: RM Young 18811
Serial #: CAO1723
Cert. Expiration: March 20, 2010
Torque Device: RM Young Torque Disc
Serial #: 2

Audit Input CCW (rpm)	Known Input Value (m/h)	Sensor Response (m/h)	Measurement Error (m/h)	Audit Input CW (rpm)	Known Input Value (m/h)	Sensor Response (m/h)	Measurement Error (m/h)
0	0.6	0.6	0.0	0	0.6	0.6	0.0
60	4.2	4.2	0.0	60	4.2	4.2	0.0
160	10.1	10.1	0.0	160	10.1	10.1	0.0
300	18.5	18.5	0.0	300	18.5	18.5	0.0
600	36.4	36.4	0.0	600	36.4	36.4	0.0
900	54.3	54.3	0.0	900	54.3	54.3	0.0

Specification: +/- 0.4

Specification: +/- 0.4

Auditor: Darrin Barton

Notes:

URS
 Rev. 8.7 (3/08)

Temperature Audit Data Sheet

Site ID: Midlothian Water Treatment Plant(Site 5)
Date: June 30, 2009
Time: 1240-1245 CDT
Sensor ID: Met One 060A-2
Serial #: unknown

Sensor Height: 3.5'
Sensor Condition: good
Sensor Level: yes
Aspirator Condition: working
Last Field Calibration: n/a

Audit Device: Digital Thermometer
Model: VWR
Serial #: 230058352
Cert. Expiration: July 29, 2009

Time of the Audit	Type of Comparison	Audit Reference Temperature (deg C)	Station Probe Temperature (deg C)	Measurement Error (deg C)
1240	Collocated Measurement	32.9	32.8	-0.1
1245	Collocated Measurement	32.6	31.8	-0.8

Specification: +/- 1.0

Auditor: Darrin Barton

Notes:

URS

Rev. 8.7 (3/08)

Precipitation Audit Data Sheet

Site ID: Midlothian Water Treatment Plant(Site 5)

Date: June 30, 2009

Time: 1245 CDT

Sensor ID: Met One

Serial #: unknown

Sensor Height: 2 inches

Sensor Condition: good

Sensor Level: yes

Sensor Clean: yes

Last Field Calibration: n/a

Audit Device: Acrylic Buret

Model: Cole Parmer

Serial #: 2

Cert. Expiration: none

Time of the Audit	Input Volume (mL)	Gauge Input (inches)	Response (inches)	Measurement Error (%)
1245	80.0	0.10	0.14	40.0%

Specification: +/- 10.0

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Rev. 8.7 (3/08)

Auditor : Darrin Barton

Notes: One side of the tipping bucket would bounce twice when full, thus biasing the reading by .01" when tipped on that side of the rain gauge.

Barometric Pressure Audit Data Sheet

Site ID: Midlothian Water Treatment Plant(Site 5) Sensor Height: 3.5' Audit Device: Barometer/Altimeter
Date: June 30, 2009 Sensor Condition: good Model: Airs-Vaisala
Time: 1240-1245 CDT Sensor Level: yes Serial #: OF1475
Sensor ID: Vaisala Last Field Calibration: n/a Cert. Expiration: May 1, 2009
Serial #: unknown

Time of the Audit	Type of Comparison	Audit Reference Barometric Pressure (mmHg)	Site Sensor Barometric Pressure (mmHg)	Measurement Error (mmHg)
1240	Collocated Measurement	736.0	737.0	1.0
1245	Collocated Measurement	736.0	737.0	1.0

Specification: +/- 7.6

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Rev. 8.7 (3/08)

Auditor: Darrin Barton

Notes:

PM₁₀ / VOLUMETRIC FLOW CONTROL (VFC) PERFORMANCE AUDIT DATA

Site ID: Midlothian Water Treatment Plant(Site 5)
Date: June 30, 2009
Time: 1220-1230 CDT
Pressure (P_a) (mm Hg): 736.0
Temperature (T_a) (F): 91.2
Temperature (T_a) (C): 32.9

Audit Device: Variable Orifice
Serial #: W-90
Slope: 0.96956
Intercept: 0.00007
Correlation: 0.99996
Cert. Exp. Date: September 30, 2009

PM ₁₀ AUDIT DATA						
Sampler ID#	Audit Pressure Drop (ΔH) ("H ₂ O)	Stagnation Pressure (ΔP _{STG}) ("H ₂ O)	Audit Flow (Q _a) (m ³ /min)	Sampler Flow ¹ (Q _s) (m ³ /min)	Percent Difference ² (Sampler vs. Audit)	Percent Difference ³ (Audit vs. Design)
583	2.80	19.7	1.113	1.138	2.3%	-1.5%
584	2.80	19.6	1.113	1.147	3.1%	-1.5%

1. From Sampler Look-Up Table or Calibration Data

2. Acceptance Criteria: ±7%

3. Acceptance Criteria: ±10%

SAMPLER CALIBRATION DATA					
Sampler ID#	Pressure Ratio (P _r /P _a) (mm Hg)	Calibration Date	Sampler Slope	Sampler Intercept	Sampler Correlation
583	0.9500	11/02/08	12.2892	0.1501	1.0000
584	0.9503	11/20/08	12.2246	0.1485	1.0000

AUDITOR: Darrin Barton

URS
 Rev. 8.7 (3/08)

Notes:

Cr⁶⁺ Sampler
PERFORMANCE AUDIT DATA

Site ID: Midlothian Water Treatment Plant(Site 5)
Date: June 30, 2009
Time: 1235-1240 CDT
ANALYZER ID: ERG CR6
Serial #: 14.0

Audit Flow Meter : BGI
Model No : deltaCal
Serial No : 579
Cert. Exp. Date : 9/5/2009

Sample Inlet Flow Audit Data		
Designed Flow Rate (LPM)	Measured Flow Rate (LPM)	Percent Difference ₂
15	15.77	5.13%
15	15.87	5.80%

2. Acceptance Criteria: $\pm 10\%$

AUDITOR: Darrin Barton

Notes:

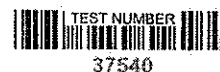
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Rev. 8.7 (3/08)

APPENDIX B

Audit Standards Traceability Documentation

625 East Bunker Court
Vernon Hills, Illinois 60061
PH: 866-466-6225
Fax: 847-327-2993
www.innocalsolutions.com

NIST Traceable Calibration Report



Reference Number: **20694**
PO Number:

URS Corp
9400 Amberglen Blvd
Austin, TX 78729

Manufacturer: AIR Inc.
Model Number: AIR-HB-1A
Description: Pressure, Barometer, Digital
Asset Number: 17414-12
Serial Number: OF1475

Calibration Date: 04/15/2009
Calibration Due Date: 04/15/2010
Calibration Interval: 12 Months
Condition As Found: In Tolerance
Condition As Left: In Tolerance, No adjustment
Procedure: NAVAIR 17-20MP-216

Remarks:

Performed calibration traceable to NIST. The barometer was within the manufacturer's accuracy, no adjustments were required. The calibration was performed at Latitude 42.233603 Longitude -87.948128 at an elevation of 737' above sea level. Note: Battery was replaced prior to collect "As Found" data.

Standards Utilized

Asset No.	Manufacturer	Model No.	Description	Cal. Date	Due Date
CP05020	DH Instruments Inc.	RPM4 BA100KS	Calibrator, Reference Pressure Monitor	12/15/2008	12/15/2009

Calibration Data

FUNCTION TESTED	Nominal Value	As Found	Out of Tol	As Left	CALIBRATION TOLERANCE
Ambient Pressure	990.0 mbar	990.19		Same	989.5 to 990.5 mbar [TUR 4.0:1] [EMU 0.12 mbar]
Decreasing Barometric Pressure Test	1030.0 mbar	1030.30		Same	1029.5 to 1030.5 mbar [TUR 3.9:1] [EMU 0.13 mbar]
	950.0 mbar	950.30		Same	949.5 to 950.5 mbar [TUR 4.2:1] [EMU 0.12 mbar]
	805.0 mbar	805.20		Same	804.5 to 805.5 mbar [TUR 4.7:1] [EMU 0.11 mbar]
	610.0 mbar	610.30		Same	609.5 to 610.5 mbar [TUR 5.6:1] [EMU 0.089 mbar]
Increasing Barometric Pressure Test	805.0 mbar	805.30		Same	804.5 to 805.5 mbar [TUR 4.7:1] [EMU 0.11 mbar]
	950.0 mbar	950.30		Same	949.5 to 950.5 mbar [TUR 4.2:1] [EMU 0.12 mbar]
	1030.0 mbar	1030.20		Same	1029.5 to 1030.5 mbar [TUR 3.9:1] [EMU 0.13 mbar]

Temperature: 22° C
Humidity: 50% RH
Test No.: 37540

Calibration Performed By:			Quality Reviewer:	
Santos, Daniel	Metrologist		Szplit, Tony	4/15/2009
Name	Title	Phone	Name	Date

This report may not be reproduced, except in full, without written permission of Innocal. The results stated in this report relate only to the items tested or calibrated. Measurements reported herein are traceable to SI units via national standards maintained by NIST and were performed in compliance with MIL-STD-45662A, ANSI/NCCL 2540-1-1994, 10CFR50, Appendix B, ISO 9002-94, and ISO 17025:2005.



CALIBRATION PROCEDURE
18801/18810 ANEMOMETER DRIVE

DWG: CP18801(A)

REV: C101107 PAGE: 3 of 3
BY: TJT DATE: 10/11/07
CHK: JC W.C. GAS-12

MODEL: **18810** (Comprised of Models 18820 Control Unit & 18831 Motor Assembly)
SERIAL NUMBER: CAD1723

R. M. Young Company certifies that the above equipment was inspected and calibrated prior to shipment in accordance with established manufacturing and testing procedures. Standards established by R.M. Young Company for calibrating the measuring and test equipment used in controlling product quality are traceable to the National Institute of Standards and Technology.

Nominal Motor Rpm	Output Frequency Hz (1)	Calculated Rpm (2)	Indicated Rpm (3)
60	320	60	600
120	640	120	1200
240	1280	240	2400
420	2240	420	4200
600	3200	600	6000
810	4320	810	8100
990	5280	990	9900
<input checked="" type="checkbox"/> Clockwise and Counterclockwise rotation verified			

- (1) Measured at the optical encoder output.
(2) Frequency output produces 320 pulses per revolution of motor shaft.
(3) Indicated on the Control Unit LCD display. Note: Divide indicated rpm by 10 to calculate actual motor rpm.

* Indicates out of tolerance

☒ No Calibration Adjustments Required ☐ As Found ☐ As Left

Traceable frequency meter used in calibration Model: DP5740 SN: 4863

Date of inspection 3/20/09
Inspection Interval One Year

Tested By RP



501 W. 6th St.
Austin, TX 78701
512/478-8793

10713 Metric Blvd.
Austin, TX 78758
512/837-8991

106 W. Nakoma St.
San Antonio, TX 78216
210/681-4280

G4 SPATIAL TECHNOLOGIES

November 18, 2008

Mr. Darrin Barton
URS, Inc.
9400 Amberglen
Austin, TX 78729

Dear Mr. Barton,

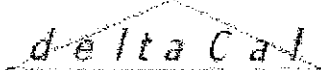
This letter certifies that your Lietz Sokkisha Model 115 transit, serial number 32100, has been examined and found to be operating within normal parameters. Inasmuch as this is a manual instrument using vernier scales, accuracy is highly dependent on the care and skill of the operator. However, when used properly, the instrument will generate one minute precision in both vertical and horizontal readings. A complete calibration of the instrument was preformed and all features are functioning to within factory specifications.

Please let me know if I can be of further assistance.

Thank you,
Neal Hagood

A handwritten signature in cursive script, reading "Neal O. Hagood".

BGI INCORPORATED 58 GUINAN STREET WALTHAM, MA 02451
NIST Traceable Calibration Facility, Registered ISO 9002:2000



CERTIFICATE OF CALIBRATION - NIST TRACEABILITY

(Refer to instruction manual for further details of calibration)

deltaCal Serial Number: 000579

DATE 5-SEPT-08

Calibration Operator: Brian DeVoe

Critical Venturi Flow Meter: Max Uncertainty = 0.346%
Serial Number: 1A *CEESI NVLAP NIST Data File 07BGI-0001*
Serial Number: 2A *CEESI NVLAP NIST Data File 07BGI-0003*
Serial Number: 4A *CEESI NVLAP NIST Data File 07BGI-0002*

Room Temperature : Uncertainty = 0.071% Room Temperature: 23.6 C
Brand: *Ertco* Serial Number: 9216
NIST Traceability No. 516837

deltaCal:

Ambient Temperature (set): 23.6 C

Aux (filter) Temperature (set): 23.6 C

Barometric Pressure and Absolute Pressure

Merriam Model 355-A10900 Accuracy: 0.020%

S/N 953100-A1

NIST Traceable Merriam Procedure A35924

deltaCal:

Barometric Pressure (set): 761.97 mm of Hg

Results of Venturi Calibration

Flow Rate (Q) vs. Pressure Drop (ΔP).

Where: Q=Lpm, ΔP = Cm of H₂O

$$Q = 3.58950 \Delta P^{0.52278}$$

Overall Uncertainty: 0.35%

Date Placed In Service _____
(To be filled in by operator upon receipt)

Recommended Recalibration Date _____
(12 months from date placed in service)

Revised: July 2007

To Check a deltaCal

5-Sep-08

BD

1.5-19.5 VER 2.56

Mbar= 1015.87

mm of Hg 761.97

Maximum allowable error at any flow rate is .75% Room Temp= 23.6 C

Serial No. 579

	Reading Abs. P Crit. Vent. Venturi	Reading Abs. P Crit. Vent. mm of Hg	Crit. Vent. Temp	TRUE Flow Lpm	A True Flow Lpm	deltaCal Indicated	% Error
# 2	291.94	219.0	23.20	2.44	2.45	2.44	-0.40
	523.84	392.9	23.20	4.42	4.43	4.42	-0.30
# 1	348.17	261.1	23.20	10.21	10.25	10.18	-0.69
	532.84	399.7	23.20	15.70	15.77	15.74	-0.17
	645.42	484.1	23.20	19.05	19.13	19.18	0.26

Average % -0.26



TISCH ENVIRONMENTAL, INC.
145 SOUTH MIAMI AVE.
VILLAGE OF CLEVELAND, OH 45002
513.467.9000
877.263.7610 TOLL FREE
513.467.9009 FAX
WWW.TISCH-ENV.COM

AIR POLLUTION MONITORING EQUIPMENT

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5028A

Date - Sep 30, 2008 Roots-meter S/N 9833620 Ta (K) - 295
Operator Tisch Orifice I.D. - W90 Pa (mm) - 749.3

PLATE OR VDC #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1	NA	NA	1.00	1.2580	4.3	1.50
2	NA	NA	1.00	0.9670	7.2	2.50
3	NA	NA	1.00	0.8800	8.6	3.00
4	NA	NA	1.00	0.8150	10.0	3.50
5	NA	NA	1.00	0.6170	17.1	6.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)		Va	(x axis) Qa	(y axis)
0.9902	0.7871	1.2223		0.9942	0.7903	0.7685
0.9863	1.0200	1.5779		0.9904	1.0242	0.9921
0.9845	1.1187	1.7285		0.9885	1.1233	1.0868
0.9826	1.2057	1.8670		0.9866	1.2106	1.1739
0.9732	1.5773	2.4445		0.9771	1.5837	1.5369
Qstd slope (m) = 1.54836				Qa slope (m) = 0.96956		
intercept (b) = 0.00011				intercept (b) = 0.00007		
coefficient (r) = 0.99996				coefficient (r) = 0.99996		
y axis = $\text{SQRT}[\text{H}_2\text{O}(\text{Pa}/760)(298/\text{Ta})]$				y axis = $\text{SQRT}[\text{H}_2\text{O}(\text{Ta}/\text{Pa})]$		

CALCULATIONS

Vstd = Diff. Vol [(Pa-Diff. Hg)/760] (298/Ta)
Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa]
Qa = Va/Time

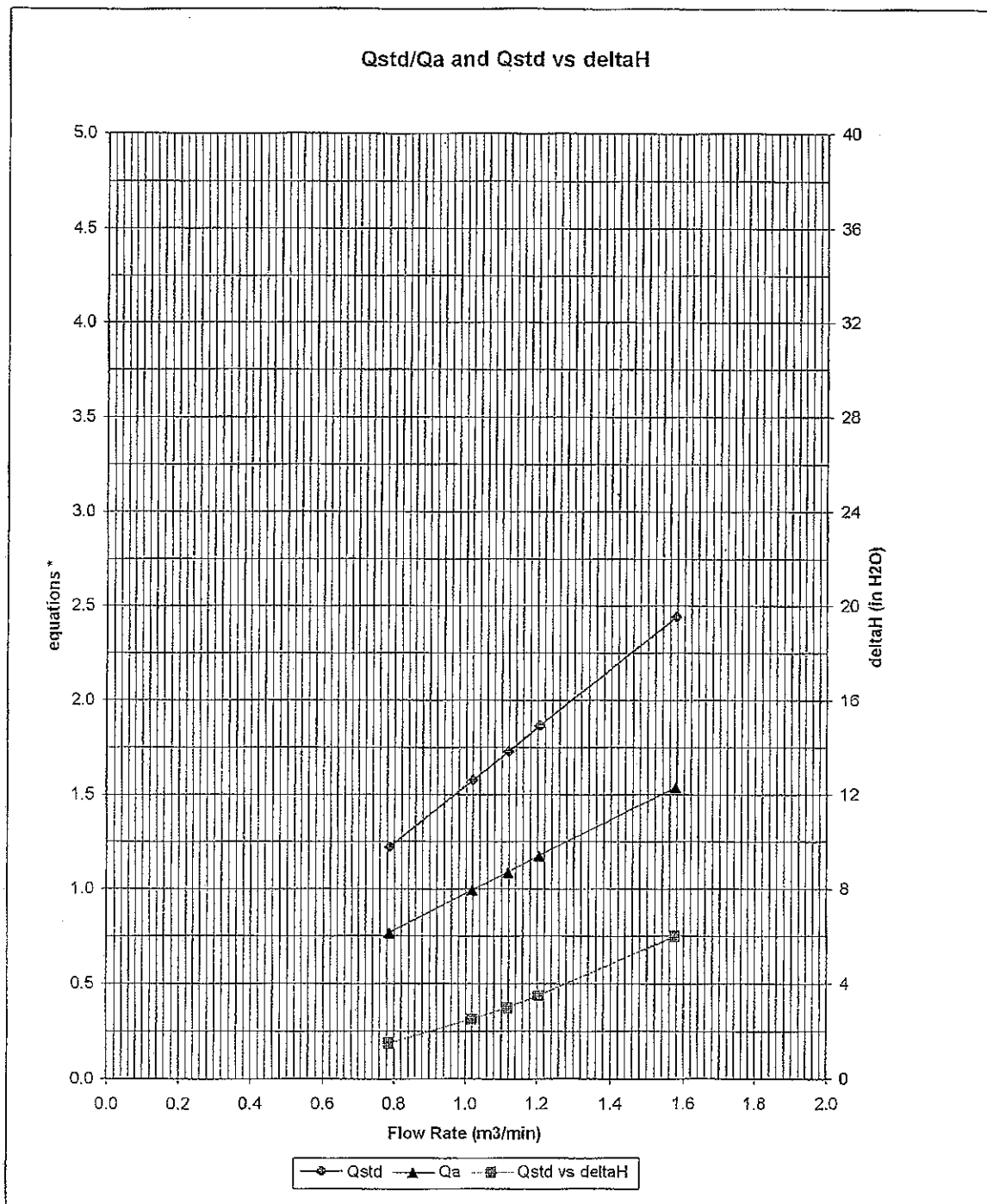
For subsequent flow rate calculations:

Qstd = $1/m \{ [\text{SQRT}(\text{H}_2\text{O}(\text{Pa}/760)(298/\text{Ta}))] - b \}$
Qa = $1/m \{ [\text{SQRT}(\text{H}_2\text{O}(\text{Ta}/\text{Pa}))] - b \}$



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 WWW.TISCH-ENV.COM

AIR POLLUTION MONITORING EQUIPMENT



* y-axis equations:

Qstd series:
$$\sqrt{\Delta H \left(\frac{P_a}{P_{std}} \right) \left(\frac{T_{std}}{T_a} \right)}$$

Qa series:
$$\sqrt{\Delta H (T_a / P_a)}$$

#W90



Calibration
Certificate No. 1750.01

Calibration complies with ISO 9001
ISO/IEC 17025 AND ANSI/NCSL Z540-1



Cert. No.: 4000-1939847

Traceable® Certificate of Calibration for Digital Thermometer

Instrument Identification:

URS Corp., 9400 Amberglen Blvd., Attn: James Clarke, Austin, TX 78729 U.S.A. (RMA:944141)

Model: 61220-601

S/N: 230058352

Manufacturer : Control Company

Model: 61220-604

S/N: 230058318

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Temperature Calibration Bath TC191	A79341		
Thermistor Module	A27129	10/17/08	1000228256
Temperature Probe	3039	10/26/08	A7710039-4
Temperature Probe	149	3/06/09	A82225037-3
Thermistor Module	A17118	8/30/08	A7831032
Temperature Calibration Bath TC218	A73332		

Certificate Information:

Technician: 68

Procedure: CAL-06

Cal Date: 7/29/08

Cal Due: 7/29/09

Test Conditions: 23.0°C 49.0 %RH 1014 mBar

Calibration Data:

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±uc	TUR
°C	0.001	-0.003	Y	0.001	-0.003	Y	-0.049	0.051	0.013	3.8:1
°C	25.001	24.998	Y	25.001	24.998	Y	24.951	25.051	0.013	3.8:1
°C	60.001	59.995	Y	60.001	59.995	Y	59.951	60.051	0.018	2.8:1
°C	100.001	100.008	Y	100.001	100.008	Y	99.951	100.051	0.013	3.8:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±uc=Measurement Uncertainty; TUR=Test Uncertainty Ratio;
Accuracy=±(Max-Min)/2; Date=MM/DD/YY

Wallace Berry
Wallace Berry, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Digital Thermometer should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Thermometers change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 4455 Rex Road Friendswood, TX 77546 USA
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2000 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-AQ-HOU.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).